Observing color film stock production across the Iron Curtain

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→ 1: Head

Thank you, …, for the kind introduction.

Good morning everyone,

I am delighted to be here today to talk about the development of the color film stock that decisively marked the film production of the last 70 years. In the framework of our research project "Film colors. Technologies, Cultures, Institutions", funded by the Swiss National Science Foundation, we aim to decode the contexts in which color film processes evolved and the conditions under which the companies operated.

INTRODUCTION

In this presentation, I am going to show you how transnational processes of observation and exchange have affected the development of the color film stock production, especially after World War II, during the period of the Cold War. The term "observing" refers to the protagonists (for instance companies, scientists, other employees) and their transfer of knowledge about color film stock production, because or despite political and ideological agendas. With the help of an epistemological approach, paired with technological, political and economic contexts, I will explain to you strategies and circumstances of technological transfer in the field of chromogenic color film.

→ 2: STRUCTURE

I want to begin with the DEVELOPMENT OF THE CHROMOGENIC MONOPACK and therefore give you a short introduction to its TECHNOLOGICAL ASPECTS; afterwards I will explain its position in HISTORIOGRAPHY and finally switch to the last part of my presentation, where I'd like to examine more closely the Transnational Diffusion of chromogenic color film with the specific case of observation and exchange in the old Agfa plant, later called ORWO.

→ 3: TRANSFER OF…

If we look at transnational relations in the realm of the chromogenic monopack, we can distinguish between diverse types of transfer movements. I would like to present to you two recurring factors of transfer of knowledge, influencing the developments. The first focuses on transfer of knowledge via a transfer of individuals from one company to another; while the second focuses on the transfer of knowledge via technological exchange and observation

across national borders. Both movements can be followed on vertical (from department or development to the next level in this hierarchy) and horizontal levels (same level at different departments, companies etc.).

→ 4: 1. Development of the Chromogenic Monopack

I have chosen four movie examples that demonstrate the relation between the aspects of technology, film production and cultural contexts in the field of the chromogenic monopack. During the presentation, I will use them as recurring symbols of transnational transfer movements in color film stock production. But I won't show you any extracts from those movies today because I am focusing on the factors that influenced every production step before the final screening.

→ 5: MOVIES

The movies that you see on this slide (NARAYAM BUSHIKO, AFRICA SOTTO I MARI, BARBE BLEUE, THE MAN ON THE EIFFEL TOWER) (represented by their posters) have something in common which goes beyond differences or resemblances in genre, production companies, countries or directors. But what I am alluding to is no less important for the final product than all the factors mentioned before. It concerns the films' shooting, as well as the distribution and theatrical presentation modes. What I am referring to is the technological and material basis of the camera negatives and prints of those movies. The technology is called chromogenic monopack.

→ 6: 1.A. Technological Aspects

But to give you a more precise insight into this topic, I will leave those movies aside and return to them later, in order to concentrate instead on the material basis for a moment.

Here is a short explanation, I quote:

→ 7: CHROMOGENIG MONOPACK

„In **chromogenic monopacks** the color-forming substances are either present in several layers in the emulsion or added during film developing later. The basic principle was discovered in 1911 by Rudolf Fischer. Unfortunately the dyes used in these processes proved to be unstable, thus leading to color fading of the films."

What does this mean?

→ 8: Kodak Film

It is the normal film material that you probably very well know (apart from the youngest) because you used it to take pictures before the introduction of digital cameras and smartphones. The analog technology of the color film stock for photography and for moving images was basically the same at the time.

→ 9: Schema

On the research platform "Timeline of Historical FilmColors" created by Prof. Barbara Flückiger, we classify the film color processes into 2 big functional groups: Applied film colors and mimetic processes. Whereas the colors of the first category were added to the silver image on film strip after its development, the color image in the second category is produced by chemical or optical principles through additive or subtractive color mixing during processing or screening of the films. Mimetic processes were aiming to match the human color perception, so that we can reproduce the colors that we see around us. The color film stock should enable this reproduction as its primary objective.

The chromogenic monopack belongs to these mimetic, subtractive processes and has, in short, the big advantage of enabling shooting with a standardized camera, the same as for black and white film materials. This means that, contrarily to previous mimetic color processes such as Technicolor, no special equipment is needed.

So, the color films based on chromogenic development facilitated the whole film production process and circulated in a broader range of countries compared to Technicolor, as you will see later. Plus, it could register all 3 primary color spectrums, each one in a single sensitized layer.

→ 10: Cross section Eastman color

On this slide, you see a cross section of the chromogenic film stock Eastman Color 5248. The chart shows the basic layers of a color film strip. In general, the first/top layer is sensitized on the blue range of the visible light and produces a yellow dye (which is its complementary color) as a consequence of light hitting the layer; the second/middle layer is sensitized on the green range (and produces a magenta dye) and the third is sensitized on red (and produces a cyan dye). The lowest (transparent) layer is the nitrate, acetate or polyester support and all dye layers are integrated in a gelatin emulsion.

→ 11: Cross sections Agfa, Kodak

One of the most important component for the chromogenic monopack is the dye-coupler. These color-forming substances are either embedded in several different layers in the emulsion (Agfacolor and Eastman Color) or added during film development (Kodachrome). Amongst other things, their composition is responsible for the specific look of a color film stock and represents a critical issue for color film stock producers who must decide which path they want to follow for their own products; f.ex. to provoke a realistic or enhanced look.

These dye-couplers and their patents are hence the basis for trading and exchange. Understanding their composition can lead you on the path of its derivation (protagonists, companies belonging).

→ 12: Posters

And this is also what distinguishes those movie examples one from another:

→ 13: Posters

They were all shot on different chromogenic film stocks, called Fujicolor, Ferraniacolor Gevacolor and Anscocolor. What differentiates them is the composition of their dye forming substances.

This is a more technological approach to film history and film production but it is worth the fundamental research, also to be able to recognize the intrinsic aesthetics of each color process (corresponding to the dye-couplers). This is also what the ERC Advanced Grant Film Colors project does, based (here) at the University of Zurich.

→ 14: HISTORIOGRAPHY

Why should we, in the humanities in general, and in film studies specifically, bother with this complex chemical/technological aspect of color film stock production?

First of all, because the current historiography of such processes is oftentimes written by experts in chemistry or physics. And those experts were frequently part of the same company system that longed for new inventions and innovations, mainly for economic reasons. That means, that they were qualified to talk about the topics they knew (technology) and, at the same time, only considered those factors that seemed to be most promising and important in terms of the decision making process in color film stock

production. The results are technical monographs dealing with film color processes in chronological order and addressing mostly teleological perspectives.

Jack H. Coote summarizes the state of affairs in 1993 as follows:

→ 15: Quote Coote

I quote:

"There have been several more recent histories, by Sipley in the US, Coe in the UK, and Koshofer in Germany, all of which make use of plentiful illustrations in colour. However, …, none of these works is a detailed technical history although they are perhaps the more easily read because of that."

And he continues by explaining the allegedly unique und new stance of his book:

"It seemed to me therefore that there is now a place for a new history, dealing in a fairly detailed manner with the technicalities of photographic colour processes and emphasizing the part that mechanical and electronic engineering have played along the way."

(End of quotation.)

Roderick T. Ryan wrote such a monograph even before Coote, concentrating chiefly on technical conditions of color film stock production. But he also tried to defend his America-centric perspective on those developments. 25 years after the introduction of Eastman Color from Kodak, Ryan indeed recognizes the efforts of non-American competitors, though excluding all the processes that could not establish themselves on the US market.

Speaking of European and Asian Color film stocks, Ryan accentuates their role for the American production companies while attributing their success to their high ability of adaptation to American standards. He also underlines their improvements by saying, I quote:

→ 16: Quote Ryan

„Each of the four film manufacturers whose products are mentioned above has contributed significantly to the state of the art technology of color motion pictures. A review of any one of these processes indicates a steady progression towards improved quality and simplification of process techniques."

(End of quotation.)

The quoted monographs link the development of chromogenic film stock only to economic and commercial factors. To standardize and adapt a product to existing requirements would have been the highest goal for a company. Quality and price are the exclusive driving forces in this system. But why quality did not always succeed is another question. I will give you an example for a less quality driven approach for business at the end of my presentation.

→ 17: Transnational Diffusion

If "History is written by victors.", This seems to be the case for the chromogenic Monopack, too. Today I want to use this platform to present you an alternative view. A view, that includes a transnational perspective on the technological process that I introduced before.

→ 18: History Victors

But let's start with the facts known from the "victors". The invention and innovation process of the chromogenic monopack dates back to the mid 1930s, even if the chemico-physical ideas were already known at the beginning of the 20th century (Rudolf Fischer). When Germany was struggling to find their own color film process, Kodak had already successfully established a remarkable tradition through its collaboration with Technicolor, for whom they produced the basic b/w film stock. Nevertheless, one of their greatest coups lied in the invention of the famous Kodachrome process (→), in 1935, and the negative-positive process Eastman Color, in 1950 (→).

The German company Agfa (→), under the roof of the IG Farben Conglomerate, presented their own response to the chromogenic color film stock market by introducing the celebrated Agfacolor, in 1936.

I could now continue by contextualizing these interesting initial moments and presenting the persons involved, but instead, I'd like to continue by jumping in time and giving you a fastforward view of the transnational dissemination process that followed the 1940s. When Germany was defeated and divided by the Allies, the Agfacolor patents spread the world.

→ 19: Map Germany

But before I proceed, I would like to locate the city of Wolfen for you. (→) It was the headquarter of the Agfa plant, built in 1909 and continued the film stock production almost immediately after World War II for the Socialist nations. From 1945 until 1964, the newly constructed film production plant in Leverkusen and the old one in Wolfen coexisted under

the same name “Agfa”. In 1964, Wolfen sold all the rights for the Agfa brand to Leverkusen and changed the company’s name to ORWO, which is an acronym for “ORiginal WOlfen”

→ 20: BIOS/CIOS

In 1945, before the Russians arrived in East Germany to take over and implement a socialist regime, the American “Combined Intelligence Objectives Sub-Committee” (CIOS) and the “British Intelligence Objectives Sub-Committee” (BIOS), put all the technological secrets from Agfa on record and therefore promoted their subsequent use.

And this is what happened afterwards…

→ 21: Weltkarte Agfa Pfeile

The patents (and former secrets) spread. (→) For example, from Wolfen in Germany to Ferrania in Italy, Schostka in Ukraine, Binghamton in the United States and Tokyo in Japan. In this animated map, you can see how the transfer of knowledge affected the global color film stock production over time.

→ 22: Movies

By the way, my four movie examples were all shot on chromogenic film stock that benefited from the Agfacolor patents, either because of the disclosure of the before mentioned reports or because of a transnational transfer of individuals who knew how to manufacture the components and/or the whole film stock. This was f.ex. the case for the Italien Ferrania.

→ 23: Pfeile Kodak

But not only the Agfacolor patents spread in this manner. (→) Only a few years later, in 1950 Kodak introduced their next big thing with the even more popular Eastman Color 5247. Due to economic factors on which I won’t expand today, those patents went on a transnational world tour as well. From their American collaborator Technicolor to Fujifilm in Japan, aaand also to Germany, but not only to the newly constructed Agfa plant in West Germany, but also to the East. To Wolfen. Where all those red arrows started.

→ 24: ORWO & OBSERVATION MODE/VISUALISATION

Now, how do we know that those patents influenced the production of the later called ORWO plant if their products never showed any signs for Kodak patents until the late 1980s? Because we find evidence for this in their research records.

→ 25: Research records

I have already collected more than 100 documents that illustrate the scientific research going on in secrecy at the Agfa/ORWO plant in Wolfen and behind the so-called Iron curtain. The parts of history which are often left aside are coincidences and unsuccessful inventions. Wolfen had a lot of the second category. Because as those records show, they failed big time when it came to improving their products in comparison to international contemporary standards. There are several reasons for this, including economic and political mismanagement. But what I want to focus on in my last part is their strategy, of knowing they were failing by constantly comparing themselves to those international standards.

→ 26: Kreislauf

The department "Analytik" (Analytics) focused on the so-called "Fremdmaterialprüfung", the examination and evaluation of film stocks from other countries. (→) They went to foreign countries or received samples from their own representatives abroad and analyzed them in their research laboratories to specify the components used. (→) This means that they had to follow several steps before even knowing what the components of their examined example were; afterwards they continued by comparing the quality of the examples (→) with their own products or with foreign film stocks.

At this point, the other international competitors would decide whether to proceed (→) with their own methods or eventually adapt them to the most common standard, which was usually held by Kodak. Agfa, respectively ORWO, was internally divided at this point (→). On the one hand, they already knew the qualitative differences (→), but on the other hand, they were not able to easily implement new standards in the ideologically controlled planned economy. This led to a lot of frustration, finally. Nevertheless, they continued the cycle of observation, exchange and slight adaptations from time to time and were falling more and more behind the international standard.

Now I can return to what I announced before: The production of chromogenic Color Film stock was not only quality driven. What I mean by this is that economic factors were adapted to socio-political as well as cultural standards and needs. Furthermore, those standards lead to transnational exchanges of products and knowledge about it.

→ 27: Slide mit Clip

I'll now show you a short clip of a documentary about ORWO, from 2011. Because the clip is in German, I want to introduce it briefly. The narrator presents the "Technischer Kundendienst"-department, consisting of employees staying permanently abroad to report back on sales and customer complaints to Wolfen. Günther Gromke, who you'll see in a moment, was one of them, working for ORWO in India. He explains in his own words what kind of agreements and conditions their international collaborations with India were built on. **(→)**

For those of you who did not understand the joke at the end: Gromke explains the difference between ORWO and other (better) color film stocks with the comparison of a fan and an air condition. He says: It's nice to have an air condition, but a fan would essentially be enough to climatize your room. And ORWO was focused on the production of mass-compatible materials to cope with the demands, not with the highest quality standard. That's why they (metaphorically speaking) produced fans instead of air conditions. The Indians however benefited from ORWO's need for favorable trade-offs and thus were able to build their own film production on the cheap color film stock.

In the framework of my dissertation project (within the research project "Film Colors. Technologies, Cultures, Institutions"), I will focus even more precisely on the cultural and socio-political conditions and contexts that caused or contributed to the growing differences between Socialist and Capitalist film stock producers. This includes potential differences in expectations and their origins.

→ 28: World map

You saw that the most common or widespread color film stock in one country was not necessarily associated with the best quality but also linked to reliable trading deals with a company such as ORWO, which was little mentioned in international monographs, f.ex. because their film stocks did not correspond to the Western standard.

What I wanted to demonstrate in my presentation is that the history of the chromogenic monopack is a history of constant transnational exchange of knowledge and products. The people and companies involved were sometimes only a few and sometimes they were extensively organized. However, the relations were always there. Evidence proves it and I shared a small part of it today with you.

→ 29: Contact

Thank you for your attention!

Additional:

Technicolor IV:

This was different with the color process that dominated before: which was Technicolor IV. It was composed of a Three-strip-register system and a subsequent dye-transfer imbibition process. The beam-splitter camera was even a unique invention by the Technicolor company and together with further equipment used, immensely affected the whole production process in financial and practical ways, as you can imagine when you see pictures of the big cameras or extremely bright light sources that were needed back then.

Ferrania:

Scientists from the old Agfa plant left Germany after World War II to work in other countries. Dr. Wilhelm Schneider is one example for this. In Wolfen, he was part of the original Agfacolor-research team and therefore had incredible insights into the whole production process. Thanks to him, the Italian Ferrania was able to build on the success of The German Agfa after World War II and acted hence at the beginning against the American competitors.